Foreword

This report has been prepared by the National Industry Group (NIG) responsible for the docks and maritime industry. It covers the period 1977 to 1982 and gives an account of how health and safety has developed during this time. The report outlines recent initiatives which have resulted from the joint efforts of employers associations, the trade unions and the Health and Safety Executive (HSE) and also looks at areas where renewed effort is needed to reduce the accident figures.

Some readers may already be aware of the significance of the NIG within the Factory Inspectorate Division of HSE. The Robens Report stressed the need for the Inspectorate to be increasingly specialised, more responsive to the problems and concerns of particular industries and better organised to deal with employers on an industry basis. Each of the Inspectorates' twenty one areas has therefore been made responsible for one major industry or sector of employment and one group of inspectors in that area are nominated as the NIG. Under the overall direction of the Area Director the NIG is responsible for ensuring as far as possible consistency of enforcement standards, coordination of enforcement initiatives, setting of priorities, the dissemination of technical information and the development of relations with employer and trade union organisations.

The docks and maritime industry has undergone radical change in the last two decades and has moved from being labour intensive to capital intensive. The fall in the number of persons employed has been more than matched by the fall in the number of accidents but few would deny that there is scope for even more effort to reduce the risk of accident and ill health. This report looks chapter by chapter at the different sectors of dock work and illustrates matters which have come to the inspectors' notice. The final chapter deals in some detail with those accidents where death resulted. The presentation is designed to highlight the contributory causes and to suggest how they may have been avoided.

The Docks Regulations 1934 are almost fifty years old and it is significant that the end of the period covered by the report coincides with the start of discussions between industry and the HSE about new legislation needed to allow the United Kingdom to ratify the International Labour Organisation Convention No 152 concerning occupational safety and health in dock work. The principle of joint consultation from the very earliest stage should, I am confident, lead to the implementation of legislation along lines acceptable to all concerned. The NIG will make a valuable input to these discussions and I am sure that all those involved in dock processes will read with interest this report.

JDG HAMMER *HM Chief Inspector of Factories*

Introduction

1 The port environment can be hazardous; 80 men were killed in the port and inland water transport industry during the years covered by this report The traditional hazards of falling cargoes, trips and falls have now been augmented by the modern hazards due to mechanised handling techniques and motor transport on the dock side. Uniting the traditional and the modern hazards is the commercial pressure to get the ship berthed, discharged and reloaded in the minimum time possible.

2 As long ago as 1899, the hazardous nature of the dock work was recognised as exposing employees in this industry to greater risk than their counterparts in manufacturing industry. The Secretary of State therefore appointed two factory inspectors with special experience of dock work to enquire into conditions within the industry. The enquiry concentrated specifically on accident prevention and on the complicated issue of who should be responsible for complying with legislation. The resultant lengthy report provides a fascinating insight into the conditions prevalent at the time. Boys of 14 or 15 were put in charge of winches; the notorious London smogs made it necessary for quay edges to be painted white and for the dock police to patrol with white guiding sticks in their hands.

3 The report prepared by the factory inspectors led to the formulation of draft Docks Regulations which were circulated to dock occupiers in 1903. The accompanying explanatory letter stated that "The Secretary of State kept specifically in mind the importance, when bringing under regulations for the first time an industry affecting so many and so important interests, of avoiding any proposals which would cause dislocation in the work of the docks, or specifically affect the employment of those engaged in the industry". Following a public enquiry to consider objections to the draft regulations, the Factory Workshop Dangerous and Unhealthy Industry Order 1904 came into effect on 1 January 1905. Many of the requirements enacted by these regulations are remarkably relevant today — fencing of docks, wharves and quays, life-saving appliances, means of escape from the water, hatchways, lighting, access to ships, machinery guarding and gear testing.

4 At the request of the Chief Inspector of Factories, a review of the effectiveness of these Regulations was carried out in 1908. One of the subsequent reports illustrates that stevedores' perspicacity has a long tradition; when asked to provide effective artificial lighting for working after dark, one stevedore decided that his men would only work during the 'day'. Arguments as to a mutually acceptable definition of 'night' then ensued. Subsequently, the 1904 Regulations were supplemented with provisions requiring artificial lighting and first-aid to become the Docks Regulations 1925.

5 In 1932, the International Labour Organisation (ILO) published The Protection Against Accidents (Dockers) Convention. This document was used as the foundation upon which the Docks Regulations 1934 were built. Clearly, Regulations made in 1934 could not foresee developments such as the move away from the traditional break bulk system towards containerisation which has occurred over the last 20 years. However, the Health and Safety at Work etc Act 1974 (HSW Act) has been used effectively by inspectors in the absence of specific Regulations. This Act also extended the coverage of health and safety legislation to encompass all types of maritime activity; this included all aspects of dock work, waterways, rivers, inland clearance depots and also brought craft such as tugs, chain ferries, ferries and floating cranes operating within the territorial baseline under health and safety law for the first time. The International Labour Organisation Convention 152, which was published in 1979, caters for both traditional and newer methods of work. The adoption of this Convention and subsequent translation into Regulations is discussed further in the conclusion to this report. There are also current discussions with the Department of Trade concerning the relative scope of the HSW Act and the Merchant Shipping Legislation

6 The collated statistics of the fatal and total reported accidents for the years 1977–82 are given in Table 1. Because of changes in accident reporting legislation, yearly comparisons of accident statistics is difficult, but the number of accidents over this period has shown a gradual decline

7 Because of the effects of the recession on the level of activity in British ports, this decline should not give rise to false optimism. However, the reduction in the accident figures does reflect, in part, the efforts of both management and workforce to improve the health and safety record

8 The National Association of Port Employers (NAPE) has continued to be the focal point for management and trades union discussions on health and safety problems Detailed guidance on the training of newly appointed Safety Officers, ro-ro operations and safe slinging practice has been published. The National Dock Labour Board (NDLB) Safety Training Scheme has continued, despite financial difficulties in the industry. The Port Medical Services, working under the auspices of the NDLB, have continued their work on the medical aspects of dock work, including vital first aid training. The British Materials Handling Board (BMHB), a body not normally associated with health and safety matters, is currently undertaking a survey into the reduction of dust generation by materials handling equipment during loading and unloading. This survey has aroused considerable interest and several large UK ports are actively

involved. The International Cargo Handling Co-ordination Association (ICHCA) has continued its work concerning safety in ports and has published guidance on Securing of Containers and Container Top Safety.

9 The passing of the Safety Representatives and Safety Committees Regulations 1977, formalised many of the industry's existing arrangements for health and safety. The main burden of training Safety Representatives was borne by the Trades Union Congress ten-day courses. This training has been supplemented by safety representative courses run by the NDLB, at which factory inspectors provided assistance. There are now signs that management and safety representatives are establishing the mutual trust and co-operation which is vital if the industry is to identify and resolve its own problems using its own resources. Several port employers have recognised the crucial role that supervision has to play in building-up this mutual trust and have provided health and safety training sessions specifically for supervisors.

10 The accident statistics demonstrate that management and workforce must exercise increased vigilance if accident rates are to be reduced further. Table 2 gives a break-down of the percentage distribution of fatal accidents by type. Nearly half of the fatal accidents are caused by transport within the docks. Of the remainder, the majority are due to two principal causes — falling objects and falls. All three of these causes may be counteracted by the provision of safe systems of work.

11 A safe system of work, usually in written form, is a preplanned stage by stage method of carrying-out a particular task in such a way as to avert actual or potential hazards. The preparation of written safe systems of work is not enough. Instruction, training and in the final resort supervision, are required to ensure that the system is understood and operative. It is also necessary, periodically, to check that the safe system envisaged in theory is actually carried out in practice. The preparation of comprehensive written safe systems of work can only be justified if the end result is achieved. Examples of safe systems of work are given throughout the report.

12 Analysis of the 80 fatal accidents by type alone masks the part played by alcohol in 13 of these deaths. Gaining access to ships becomes extremely hazardous after a drinking session. Port employers, agents, shipping lines, masters and employees themselves all have a part to play in the education process necessary

Fig 1 Improvisation of any job on the quayside can lead to disaster

to convince men that drinking and the dock side are a lethal combination which must be avoided.

13 A detailed analysis of the reported accidents by type during 1981 and 1982 is given in Table 3. This confirms that falls, trips and being struck by objects or material account for over half the total number of reported accidents. It is also interesting to note that nearly 20% of all reported accidents are due to over-exertion during the manual handling of goods. The three Tables highlight those areas in which accident prevention programmes may best be directed.

14 Some of these accidents could have been avoided at the ship design stage. The example of corrugated bulkheads illustrates that commercial advantages do not always correspond to improved health and safety. The possibility of men falling between the corrugations has been shown to be a practical reality (see para 29). Designers and builders should bear in mind the health and safety of the end user.

Table 1 Port and inland water transport: number of fatal injuries and total injuries reported to Factory Inspectorate 1977–82

Year	*Fatal accidents*	*Total accidents*
1977[a]	17	3862
1978[b]	15	3569
1979[b]	17	3113
1980[b]	10	2542
1981[c]	9	2482
1982[c]	12	1992

[a] Factories Act only

[b] Includes accidents notified under OSRP Act and HSW Act.

[c] Accidents to employees only, notified under NADO Regulations (provisional)

Table 2 Port and inland warehouses: percentage distribution of fatal injuries by type, 1977-82

	% of all injuries
Struck by falling object	18.75
Struck by swinging object	2.5
Transport	(41.25)
struck by	7.5
crushed	16.25
run-over	7.5
collisions	2.5
others	7.5
Falls to lower level	21.25
Explosions	2.5
Asphyxiation	3.75
Others	10.00

Table 3 Port and inland water transport: percentage distribution of injuries to employees by type for the year 1981 and 1982

	% of all injuries	
	1981	1982
Falls of persons to lower level	12.9	12.1
Falls, trips etc on same level	21.7	20.9
Struck by object or materials	22.2	24.5
Stepping on or striking object	9.6	7.5
Caught or trapped in under or between objects	9.3	9.8
Caught under collapsing objects	0.4	0.2
Over exertion, strenuous or awkward movements	18.9	19.3
Others	5.0	5.8

Conventional cargo handling (load on load off)

Control of transport operations

15 A safe system of work should be devised to achieve the effective control of all transport operations on docks, wharves and quays. This system of work should include several key elements such as clear road signs, preferably to Road Traffic Act standards, as illustrated in Fig 2; sign-posted parking areas for private vehicles and for goods vehicles awaiting or delivering loads, and appropriate warning notices to identify hazardous areas on the dockside. Drivers unfamiliar with the layout of a particular berth should receive instructions from the dock operator. Whatever the control system, effective policing, using local bye-laws where appropriate, should be provided to maintain safety. Useful information on this subject is contained in HSE Guidance Note GS9: *Road transport in factories.*

16 Specific training is an essential part of the safe driving of any vehicle, for although an employee may possess a current motorcar licence it does not mean that he is necessarily competent to operate a lift truck. There are a number of organisations who provide training courses for driving vehicles and those run by the National Dock Labour Board are specifically designed with the dock industry in mind. Training, moreover, should be continuous and refresher courses must be considered subsequent to initial training, to take account of, for example, technological developments in cargo handling plant.

Means of access across docks and berths

17 Designated safe walkways should be provided across larger berths and complex dock areas to

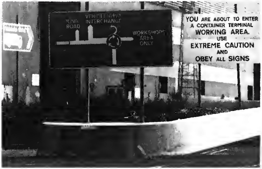


Fig 2 Good signposts get drivers across the dock in safety.

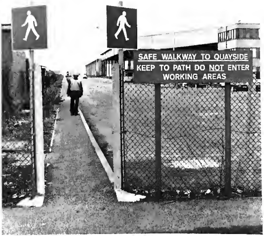


Fig 3 Designated safe walkway — signpost and instructions.

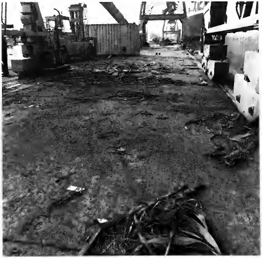


Fig 4 Maintenance of good housekeeping helps prevent accidents

segregate pedestrians from vehicular traffic. The safe walkways should be designated by pictorial signposts and/or instructions (see Fig 3) and, where appropriate, ground markings. The walkways are necessary for, and should be used by, all categories of person who require access both to and from the quayside. Recognising that some of these persons will be foreign nationals, at least one dock occupier provides maps of the dock area with the safe walkways clearly shown and brief instructions, in 17 languages. This comprehensive approach is to be commended.

18 Link span bridges to pontoons should also have separate pedestrian walkways or else pedestrians should be restrained from using the bridge until traffic movements have stopped. Such restraint cannot be left to commonsense; supervisors should be present to ensure that visiting pedestrians do not use traffic routes while work is proceeding.

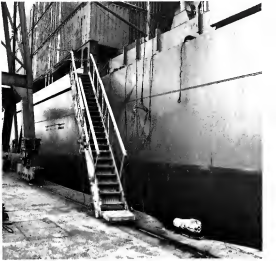
19 The maintenance of good housekeeping on the dockside also contributes to safe means of access across docks for pedestrians. Loose materials such as dunnage can be projected from underneath the tyres of mobile plant with lethal consequences. Fig 4 illustrates a poor standard of housekeeping.

Means of access to ships

20 The primary duty to provide safe means of access to a ship under the Docks Regulations 1934 falls to the ship owner or master. If neither the ship owner nor the master can provide safe means of access, then the stevedores should do so. In enclosed docks, the provision of gangways or accommodation ladders should always be practicable. Fig 5 illustrates an accommodation ladder which, although of sound construction presents a major hazard because the hand-rails do not extend to give protection at its lower end.

21 At tidal quays or jetties, the rise and fall of the water level presents greater difficulties in providing safe means of access. Vertical ladders at the edges of wharves, provided originally as a means of escape for a person in the water, are used to board a vessel at low tide. Notwithstanding the use of these ladders, access to ships at low tide and/or with low freeboard can be provided by building low level walkways into the jetty structure. These walkways are then used to support gangways. This alternative approach is to be recommended.

Fig 5 Hand rails should extend to the full length of an accommodation ladder



22 Where ships with a very high freeboard such as very large crude carriers (VLCCs) visit jetties, access towers have been built and used.

23 On rare occasions, neither a gangway nor an accommodation ladder can be provided and a portable rigid ladder forms the means of access. In this case, the ladder should extend at least one metre above the quay level and should be lashed to prevent slipping.

Means of access on board ships

24 Top deck stowages can obstruct walkways across the weather decks on board ship and, occasionally, the stowage may form part of a 'remain on board' cargo destined for another port. Properly constructed temporary steps and walkways should be provided to enable the dockworkers to gain access to the holds. Alternatively, part of the obstructing cargo can be unloaded to allow free access to the holds.

25 Within the holds of the ship, ladders which are flush with the sides of the hatch coamings are still encountered on older vessels. This type of access ladder is prone to damage by swinging loads; in which case relocation of the ladders under the recessing of the mast houses or the wings of the ship is recommended. Where relocation is not reasonably practicable, the ladders should be inspected carefully before use.

26 As a last resort, portable ladders may have to be used to gain access into a ship's hold. If the stevedore proposes to use ladders belonging to the ship, then a thorough inspection before use will be required. The unloading of 'shot' stowages (those that have shifted during the voyage) is an example of the type of situation which will demand the use of portable ladders. Fig 6 illustrates this type of problem.

Ships hatches

27 Falling hatch beams is possibly one of the best known hazards in the dock industry. For nearly 50 years, the Docks Regulations have imposed an absolute requirement that the beams of any hatch in use, if not removed, should be adequately secured to prevent displacement. Wooden hatch boards and metal beams are now largely confined to small vessels and

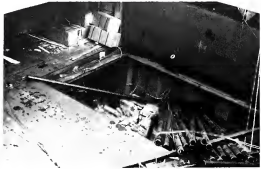


Fig 6 'Shot' stowage pose special problems for the stevedore.

barges, whereas hatch coverings on larger ships are now of a completely different design.

28 Hatch covers come in three distinct types — pontoon hatch covers removable by crane, hydraulically-operated, sliding, folding covers and chained roll-back covers opened by winch. Whatever the type, being crushed between the hatch covers or between the covers and fixtures during opening or closing has resulted in several fatalities (see paras 138, 139). Opening and closing hatches should be governed by a safe system of work, so that the hold is verified as empty and all persons are well clear before movement of the hatches commences. The direction of the ship's officer within whose sphere of competence opening or closing of the hatches falls, should also be a pre-requisite of the system of work.

Corrugated bulkheads

29 Corrugated bulkheads in a ship's hold are a relatively new feature of the larger bulk carriers, and although such bulkheads combine strength with maximum space, the construction has created hazards for the dockworker. For example, ships with corrugated bulkheads have been used to carry break bulk cargoes. The cargoes are usually stowed to the edges of the corrugations, leaving gaps approximately 2 x 3 ft at intervals across, and to the full depth of, the hold. At least two serious accidents have occurred when dockworkers have fallen down these gaps, the difficulty of administering prompt first aid in such a situation can be imagined.

30 Several methods of protecting against this hazard have been proposed, these include the placing of air bags or nets across the gap or welding bars across the bulkheads at regular intervals. Other possible solutions are still being sought.

Dockside cranes

31 Safe working procedures for the use of cranes are well established; BS CP 3010:1972 *Code of Practice for the Safe Use of Cranes*, deals with the use of mobile cranes, tower cranes and derrick cranes; BS CP 5744:1979 of identical title covers the use of travelling cranes, portal jib dockside cranes, container handling cranes and others. A recent report published by the HSE on three mobile crane accidents highlights the responsibilities of management in the use of cranes.*

32 Crane designs are continually being improved and in particular more and more safety features are being incorporated. Older cranes not originally designed for dockside work can be modified to improve safety standards; for example, at the request of one user, the manufacturer installed a second elevated cab on an older crane to give the driver a better view of the ships holds. However, in spite of these improvements, accidents and dangerous occurrences involving new and older cranes continue to be reported. During 1981, details of all dockside crane collapses and overturns were studied by the National Industry Group revealing three common causes of failure — poor maintenance, misuse and control malfunctions.

33 High standards of maintenance are required to ensure the safeworking of cranes. Maintenance procedures should be documented and preventative

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**Management's Responsibilities in the Safe Operation of Mobile Cranes*. Report on 3 Crane Accidents HSE Report 1980. ISBN 0 11 883301 4.

maintenance work recorded and, where necessary, supervised. Several failures of cranes during 1981 were attributed to inadequate maintenance. In one case, the braking system of a crane failed due to corrosion of critical components; in another case, a small mobile crane was loaded beyond its safe working load and yet might not have overturned but for the fact that the tyre pressures were very low.

34 Misuse of the cranes come about either by direct overloading or by the imposition of excessive side loading on the jib resulting in failure of the jib structure. For example, following a portal quay crane jib collapse, it was established that the jib had been repeatedly subjected to excessive side loading and that the grab was large enough to overload the crane by as much as 15%.

35 Control malfunctions occurred particularly on older cranes. In two cases jibs dropped when the derricking drum pawls failed to engage in the appropriate ratchets. The pawl engagement mechanism relied solely on gravity, but no devices were fitted to prevent the release of the jib if the pawls failed to drop. Interlocking of the pawls to the derricking controls is recommended. In another case the 'hoist raise' contacts of a large mobile crane welded in the closed position. As a result, the jib over-ran the upper derricking limit and the jib was brought back over the driver's cab, crushing it.

36 The dangers arising from crane abuse are self-evident. It is incumbent upon all involved in the use of cranes to think through the safety implications of a particular job before work commences. Initial training is essential and as crane technology changes, refresher training both for the crane driver and for maintenance personnel is necessary. For example, a dock worker trained to drive a small mobile crane with a derricking jib fifteen to twenty years ago, would require additional training to drive a modern 40-ton mobile crane.

Ships cranes and derricks

37 The International Labour Organisation have published a code of practice, *Safety and health in dockwork*, which contains several chapters and eight appendices detailing the examination and testing requirements for all lifting appliances and gear used in cargo handling. These examinations and tests are now widely accepted as an international standard.

38 The causes of accidents at ships cranes and derricks are very similar to those associated with dockside cranes — namely poor maintenance and abuse. The failure to maintain applies equally to load bearing members such as wire ropes, sheaves and winches, and to the non-load bearing members such as limit switches or other safety devices. Abuse of ships cranes or derricks may not lead immediately to failure but if left uncorrected will contribute to the ultimate demise of the lifting equipment.

39 Poor maintenance of a load bearing member of a ship's derrick was demonstrated in a case that involved a six-year-old vessel. Despite its age, the ship was exceedingly rusty. Nevertheless, the gear register showed that the derricks had been thoroughly examined, inspected and passed by foreign surveyors. Some of the derrick wires had been greased superficially but the span tackle, no doubt due to its inaccessibility, had not been greased and was extensively corroded. The derrick was being used to load in the normal manner, when the span tackle failed under less than one-fifth of its stated breaking load. As a result, a prosecution was brought against the ship's master for both the evident corrosion of the wire and for the fact that more than 10% of the individual strands in a length of eight diameters had broken.

40 Failure to maintain non-load bearing members was illustrated when a limit switch fitted to the base of a derrick malfunctioned. The purpose of the limit switch was to prevent the derrick slewing beyond a pre-set point in the operating arc of the boom. The fault was ignored by the stevedores who continued using the derrick and at one stage slewed beyond the pre-set limit to reach the end of a barge. The derrick's span tackle fouled on a protrusion at the mast head causing the wires to part and the boom to drop. Neither the ship's crew nor the stevedores had appreciated the importance of the limit switch, although both knew of the malfunction.

41 Abuse of derricks often leads to the 'banana-ing' of the boom (Fig 7). In many cases this is due to the derricking limit switches being deliberately overridden. Inevitably such abuse will lead to failure and in this context training and supervision to ensure the safe working of the lifting equipment is of paramount importance.

Problems with particular cargoes

42 One of the special skills of the stevedore is to plan and adapt both the method of work and the equipment provided to enable loading and unloading to be carried out safely. Safe systems of work should be prepared to take account of any inherent risks or difficulties associated with a particular cargo. The following three examples and Fig 8 illustrate the problems that can arise with types of cargo.

43 A cargo of railway lines had to be unloaded from a hold and because the vessel had unusually small hatch openings, there was only just sufficient clearance

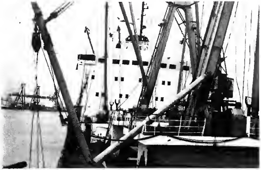

Fig 7 'Banana-ing' of derrick boom — often due to abuse

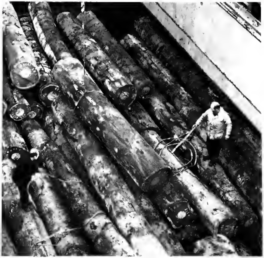

Fig 8 Special cargoes need special systems for safe unloading

between the combings and the rail ends. It was appropriate that special clamps would be needed. However, the clamps made did not prevent the rails slipping through them. As one batch of rails was being lifted, it caught on the hatch combing, the rails slid out of the clamps and fell to the bottom of the hatch, fortunately without injuring anyone. More forethought and time taken to construct the clamps would have prevented a potentially dangerous incident.

44 Bales of raw rubber regularly arrived at a particular port and a special sling was designed to lift these out of the hold, four at a time. On occasions, adjacent bales would stick together resulting in more than four bales being lifted. During a lift, an additional bale came adrift while in mid-air, struck the quay and bounced along it injuring a man some distance away. After discussion with the exporters, bales were wrapped to avoid adhesion.

45 Unloading of 'shot' stowages is a hazardous operation for the dockworker. A cargo of long steel pipes was stowed on the 'tween deck of a vessel but the 'tween deck hatches were not replaced. During a winter voyage, the pipes became loose and rolled down into a precarious position, wedged between the 'tween deck and the lower hold. An inspector visiting the port found men working in extreme danger trying to secure the pipes; one false move could have caused the pipes to fall taking the men with them. The ship's derrick boom in the stowed position was directly above the hold and would have made an excellent anchorage for safety lines, but management had not even considered the use of such equipment. For these one-off occasions, it is essential that management institute a safe system of work before unloading begins and ensures by supervision that the system is effectively carried out.

Specialised handling techniques

46 The development of specialised handling techniques to enable particular cargoes to be lifted safely has gone on apace. Covering all of these developments would be an impossible task; three examples, the unitised strap lifting method, special clamps and vacuum lifting equipment, have been selected to illustrate methods of overcoming problems.

47 The unitised strap lifting method is used for handling forest products such as baled pulp or sawn timber. The strapping is used both to bind the individual parcel and for lifting. Flat hooks specially designed for the purpose should be used for lifting, rather than ordinary 'C' hooks. The hooks should be placed under the strapping so that the tension within the straps does not exceed the rated load. Two hooks per strap should be used and so spaced as to position the hooks at or near the edges of the load. In addition, port employers should ensure that the strapping meets the standards of strength, jointing and bandling method specified by the manufacturers.

48 Special clamps have been used extensively throughout the industry, particularly for lifting sheet metal or paper reels. Cargo lifted using clamps has occasionally been dropped; this is usually due to either the incorrect positioning of the clamps or the wrong type of clamps being used. Training of operatives and supervision should be used to counteract the wrong positioning of the clamps. Correct selection of special clamps is also essential to safe working. For example, paper reel clamps can have either serrated metal or rubber lined faces. Serrated metal clamps are suitable for harder and heavier reels of liner board but not for newsprint; rubber lined clamps are suitable for newsprint but not for liner board. The manufacturers or suppliers of specialised clamps should be consulted as to the corrected selection and usage of each type of gear.

49 Vacuum lifting equipment is used by certain shipping lines on vessels carrying suitable cargo such as newsprint. Doubts have been expressed at an international level about the suitability of the presently accepted standards of safety and consequently safety precautions vary. Some installations incorporate a vacuum reserve tank with warning bell and light set to operate at less than 70% of full vacuum. In the event of a power failure, a battery driven audible warning is activated to warn persons in the vicinity below. On other ship installations, dual vacuum pumps have been fitted without reserve tanks and such ships load or discharge on the condition that no persons are allowed in the vicinity below the operating area. Until suitable standards can be agreed, the most reasonable precaution to follow is simply to prohibit persons from standing below the lift area; the lift area should extend to cover direct falls of reels and rebounds. Vehicle drivers on the quays waiting to load or unload reels should position themselves well clear of the cab.

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Construction, inspection and meintenance of containers

50 A freight container is invariably huilt to International Safety Organisation Standard 1496, which details the required performance parameters The prototype of the design is subjected to specified tests which include lifting, stacking, internal loading and racking. Batch production is subject to quality control tests on random samples. Any container built after September 1982 should be approved and plated to conform with the International Convention for Safe Containers (CSC). It will be necessary for all containers to carry a CSC Safety Approval Plate by 1 January 1985.

51 Once in use, the container is subjected to the rigours of handling and the frequency of this handling is an important factor in determining wear and tear. In this context, a survey was carried out in the United States in 1975 which indicated that, on average, a container was lifted 34 times per year. However, a recent accident investigation in the UK revealed that a particular container used on short sea routes had been lifted about 250 times a year.

52 Like all plant, containers require routine inspection and maintenance to avoid failures, as failure of a container can be a disaster both from a safety and from a commercial point of view Owners of containers are required by CSC to have their examination schemes approved which will ensure that the examinations are carried out on a routine basis. The prudent operator should draw up a container inspection programme using competent staff. The programme should reflect the frequency and severity of use to which a particular container is subjected, and where an inspection reveals defects, the repairs should be carried out by a competent person.

53 Lack of inspection or competent repairs have been identified as the main contributory causes in the 100 or so failures of containers which occur each year. For example, inspection of a partly loaded container which failed during lifting, revealed that the defective corner post which caused the event had progressively cracked starting at the weld of the web and continuing into the parent metal of the post. It was estimated in this case that the fault had been progressing over almost three years, more than enough to identify and remedy the defect.

The one-trip box

54 The working life of a container is finite. As time passes the maintenance cost to keep it in a safe working condition increases. The larger fleet owners have recognised this problem. Containers which are considered no longer serviceable are withdrawn from international service and sold for other uses. The market in second-hand containers has expanded rapidly as a consequence. Whilst some of these containers may be repaired and re-used, many are so worn out or damaged as to make economic repair for freight purposes impossible. Some of these badly damaged containers are being used on one-way trips to transport goods out of UK ports. These containers have become known as 'one-trip boxes' and several have failed during lifting.

55 One such failure occurred at a UK container port. Fig 9 shows the condition of the box after failure. Investigation revealed that the container was ten years old and due to its deteriorating condition, it had been sold off as a tool store on a construction site. Eighteen months later, a dealer in second-hand containers bought the container by telephone for £300 and almost immediately sold it to a freight forwarder for £500. Neither the dealer nor the freight forwarder carried out an inspection to ascertain the condition of the container. The container was loaded with 16 tons of fire doors and when lifted by a straddle carrier, one of its sides separated from the floor. As a result, the second-hand dealer was successfully prosecuted under Section 6 of the HSW Act. The freight forwarder was eventually faced with costs running into thousands of pounds.

56 Section 6 of the HSW Act places, *inter alia*, a duty on any person who supplies any articles for use at work to ensure so far as is reasonably practicable, that it is so designed and constructed as to be safe and without risks to health when properly used. Information on this matter is contained in the publications HSE leaflet IND(G)1(L) *Obligations on importers of machinery, plant and substances in Great Britain*, and Guidance Note GS8 *Articles and substances for use at work*. The supplier of a second-hand container must have it examined to ensure it is adequate for the purpose for which it is intended. If he cannot do this himself, then he must ensure that it is done on his behalf by a competent person.

Container berth lay-out and operations

57 The first containers were handled as deck cargo on conventional vessels, which meant that container handling and traditional break-bulk traffic were carried out alongside each other on the quayside. However, the rapid increase in the rate of cargo handling increased proportionately the number of transport vehicles needed to move the containers, and this in turn created additional congestion on port roads and on the quayside. This congestion gave rise to further problems, especially in the case of straddle carriers where the drivers' view downwards is restricted. In one incident, a straddle carrier overturned while travelling along the quay when one wheel unit sheared after striking an obstruction that the driver could not see. In another, the driver of a motor tractor unit was decapitated when the container

Fig 9 No wonder the container sides failed

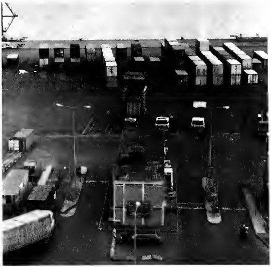


Fig 10 Good lay-out of container berth

of a loaded straddle carrier passed over the driving seat of his vehicle.

58 Recognising that a total re-think of container working methods was required, the Health and Safety Executive (HSE) set up a Committee on Container Berth Safety to consider the dangers arising from the movement of freight containers and the use of mobile handling equipment. Members of the Committee included representatives of the Confederation of British Industry, the Trade Union Congress, the HSE and other interested organisations. The Committee reached three broad conclusions. Firstly, that container working should be segregated from general cargo handling. Secondly, that an effective system had to be devised controlling movements of lorries and straddle carriers so as to avoid collision. Thirdly, that pedestrians should, as far as possible, be excluded from straddle carrier operating areas. Where persons had to enter potentially dangerous areas, rigorous control of traffic movements was required.

59 The guidance booklet HS(G) 7: *Container terminals: safe working practices*, was published as a result of the deliberations of the Committee. The booklet contains specific guidance on terminal layout (Fig 10), control of traffic movements, training of drivers, container handling and emergencies. The advice within the booklet should form the basis for the safe handling of containers at every container terminal.

Lifting of containers

60 The container is a box holding a load which cannot be seen and therefore the weight cannot be estimated. Containers which arrive by road can have their weights checked by weighbridge, but those arriving by sea cannot be checked in this way; so reliance must be placed on documentation. There is ample evidence to show that documentation is frequently incomplete and often incorrect. In some cases this is due to ignorance or incompetence; in others there is a strong suspicion that some shippers and packers deliberately understate the weight of the containers. It is essential that Port Authorities follow up cases where incorrect or inaccurate information is supplied; it is also essential that shippers and packers appreciate the need to supply accurate information.

61 In UK ports a variety of crane types are used to lift containers. Whatever the type of crane, it should be capable of lifting the anticipated load at the required radius with an adequate margin of safety to deal with the unexpected. At one port, a mobile crane of limited capacity was used to lift an 'empty' container from a ship. The container turned out to be full of machinery parts and the load was such that the crane overturned. At the suggestion of the Factory Inspectorate the Port Authority fitted Automatic weight indicators to its fleet of mobile cranes. The crane driver was then aware of the load about to be lifted.

62 Top lifting of containers should be carried out using purpose-built spreader beams. In addition, wherever possible, twist lock units should be fitted to the spreader beam to engage directly into the top corner fittings of the container, and the design of the spreader beams should be such that the lifting forces on each corner of the container act in a vertical direction. Improvised use of the spreader beam can have serious consequences. At one port, a ship's derrick was used to lift on board a 20 ft container full of asbestos cement components. As the derrick cargo runner terminated in an eye rather than a hook, an ad hoc connection between the spreader and the cargo was devised. The ship's officer produced a wire rope strop of doubtful origin and lifting commenced. Before lifting was completed, the strop broke and the container fell back onto the quay, narrowly missing the Berth Superintendent.

63 One unsatisfactory method of lifting empty containers is by the use of a two-leg wire rope sling. The hooks of the sling are connected to opposing corners of the empty container. The lift may well be within the capacity of the sling, but distortion of the container can result. This makes the subsequent use of the spreader beam problematical.

Straddle carriers

64 The straddle carrier has been involved in a range of serious and fatal accidents during its use as a container lifting device, and although the latest design of straddle carriers has much better vision than the earlier models, it is unlikely that improvements will reach the point where vision can be said to be entirely satisfactory. In addition, the earlier models will remain in service for years to come, especially via the second-hand market. A sophisticated system of vehicle movement control is therefore essential.

65 The close proximity of the drive engines to the driving cab gives rise to noise problems in the cab. Suppliers and manufacturers of straddle carriers have a legal obligation to ensure that noise levels are as low as is reasonably practicable. Users of straddle carriers must also ensure that any sound reduction measures provided are effectively maintained. Examples have come to light where poor maintenance of engine cowlings, sound deadening etc have nullified the attempts to reduce the noise levels.

Fork lift trucks

66 There has been a sharp increase in the use of heavy duty fork lift trucks for container lifting especially at ports where containers are loaded onto ro-ro and stow-ro vessels. However, the use of these trucks for this purpose poses certain problems. For example, the carrying of containers totally impairs the truck driver's field of vision, so the provision of a banksman or banksmen to ensure safe passage of the

load is essential. Furthermore, fork lift trucks frequently have to negotiate steep lifting ramps, especially on ro-ro ships. Truck users should be aware of the limitations of the equipment and ensure that risks are not taken during loading and unloading.

67 The question of truck stability is also of great importance. Experience shows that the centre of gravity of a container is rarely at its geometric centre. As the container lifting pockets are fixed, this can frequently mean that the truck's stability can be adversely affected. The National Association of Port Employers are currently carrying out studies into this problem. For the present, special care should be observed and an adequate margin of lifting capacity allowed if for any reason the out-of-balance loading is likely to be excessive.

Access to container tops

68 In spite of the development of sophisticated automatic spreader slings, access to container tops is often necessary. From time to time a container structure distorts and special fittings have to be placed to allow the twist locks of the automatic spreader to engage. In some ports, only manual spreaders are available. Once the container is on board ship, or before it is removed, there is a need for riggers to work lashing or unlashing.

69 The most common method of gaining access to containers is by ladder, in which case it is essential to ensure that the angle of use is correct at 75° (or 4 to 1 slope) and that the ladder is lashed or positioned to prevent slipping. The ladder should be long enough to project 1m above the container to provide a hand-hold for the use to move safely from the ladder to the container top. Accidents still occur because these simple precautions are not observed.

70 Access to container tops to operate manual spreaders can be provided using a platform (Fig 11). Where container cranes are available, use is often made of the spreader beam to carry men engaged in slinging or lashing. In this case a suitable platform, built into the spreader, must be provided to prevent persons falling.

71 During rigging work, a purpose-built platform is often used to enable men to carry out lashing in safety. The use of container cranes to carry slingers

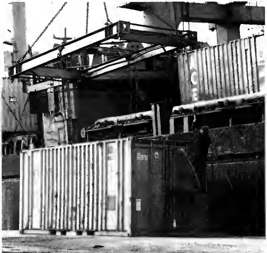


Fig 11 Simple platform gives safe access to container top

and riggers can be a safer approach than the use of ladders. However, care must be taken to ensure, for example, that the crane controls do not permit the crane to 'run away'. Consultation with the local factory inspector is strongly advised where men are carried by crane.

72 In premises where containers are lifted off lorry trailers on a 'production line' basis, platforms to one side of the line have been provided. This enables slingers to walk across the platform onto the container top.

73 One method of gaining access to the container tops, which is not recommended, is by ascending on the hook of a crane. Where there is no alternative to this method of work, the worker concerned must be provided with, and use, a suitable safety harness preferably of the inertia reel type. Close supervision is needed to ensure that such safety equipment is used at all times.

74 The most recent innovation on the shipboard side is the provision of a special purpose personnel hoist situated between the container stacks. The platform enables slingers and riggers to be taken up to the required level. The one example seen may have long term potential but at present it requires considerable development to meet UK safety standards.

Stowage of goods in containers

75 Guidance on the stowage of goods is contained in BS 5073:1982 *The British Standard Guide to Stowage of Goods in Freight Containers*. The need to train staff on the correct methods of stowage cannot be over-emphasised. The principal problems which occur are over-loading, poor weight distribution, bad stowage and ineffective shoring of the cargo during packing.

76 Over-loading was dramatically illustrated in the case of a container of scrap metal parts — the declared weight 17 tons, actual weight 33 tons! Unfortunately, the sheer volume of container traffic mitigates against check-weighing every individual container, but where sample checking does reveal over-loading the point should be taken up with the dispatchers. Where appropriate, subsequent containers from the same source should be checked on a 100% basis.

77 The poor weight distribution of a load has led to instances where the bottom of the container failed, not because of the total load, but because an uneven weight distribution of a few heavy components caused local overloading. If a load consists of a few heavy items with a small floor contact area, then steps should be taken to spread the load evenly.

78 Bad stowage of chemical drums can lead to puncturing and leakage at the bung and to the release of toxic fumes, with potentially serious consequences. Even where the contents of a drum are not toxic, loss of part of the cargo and its inevitable contamination of the other goods within the container leads to major commercial problems.

79 Ineffective shoring of goods within a container was graphically illustrated when a Customs Official requested that a container awaiting export be opened. As the dockworkers released the door securing arrangements, the doors were pushed violently opened by the pressure of the cargo within. The men had to leap backwards to avoid being struck by metal components. It must be appreciated that packing and shoring a container for a long sea voyage is a totally different operation to loading a delivery lorry.

Correct marking of containers

80 Freight containers, as well as packages, vehicles, portable tanks or tank containers, which contain dangerous goods should all be marked in accordance with the International Maritime Organisation Dangerous Goods Code to show, as appropriate, the name of the goods and the nature of the danger to which the goods give rise. For the credibility of the safety marking system to be maintained, the correct markings should be affixed to the container when loaded and removed immediately following the discharge of the contents. Fumigated cargoes from abroad frequently arrive in the UK without any form of markings to show the risk. Further problems occur when labels remain attached to the containers. For example, a container documented as carrying canned fruit arrived at an inland clearance depot marked with the Ionising Radiations label. Extensive and time consuming checking was then necessary to establish that the contents were indeed canned fruit.

Emergency procedures

81 Occasions arise where, for a variety of reasons, the packaging of a chemical is breached and spillages or leakages of toxic, corrosive or flammable materials result. A safe system of work should be devised to cover such contingencies, and a responsible person(s) appointed to co-ordinate remedial action. Staff should be instructed and trained to follow pre-determined procedures. Sufficient information available on site is essential and should include Health and Safety data sheets relating to the specified chemicals within the container. The following example illustrates that problems can arise.

82 An unmarked freight container loaded with drums of fine powder arrived at an inland freight depot for short term storage; not only were the drums unmarked and poorly packed, but no information was available to indicate the nature of their contents. During unloading, one drum overturned, spilling its contents onto the container floor. In the absence of any safety instructions, an employee swept up the spillage,

ignoring the dust cloud that the broom created. He subsequently became quite ill and was detailed in hospital. Investigations revealed that the powder was highly toxic. Prior to the incident the container depot had decided, as a general principle, not to handle hazardous cargoes, but no system had been devised to positively exclude this type of cargo. The depot has now revised the method of working. Cargoes are vetted prior to arrival so that potential hazards can be identified and planned for in advance.

Roll-on roll-off operations

Traffic control

83 The basic elements of a safe system of work for traffic control on the dockside have already been outlined in para 15; additional safeguards are required for vehicle control at ro-ro operations. All areas where drivers have to work should be provided with good lighting. The driver's field of vision should be as wide as possible at all times, especially during manoeuvres in the ship's hold. Reversing loaded trailers off the ship should generally be avoided, but where reversing is necessary signallers should always be employed. The control of vehicles can be jeopardised by steep ramps — as a consequence, the incline of ships' ramps and of linkspan bridges should preferably be 1 in 15 and not exceed 1 in 10. Either an anti-slip treatment or grilles should be provided on the ramps to assist vehicle grip. High visibility jackets should be worn by all dockworkers and others who work on board.

Means of access on board ro-ro ships

84 Segregation of vehicular traffic and men working abroad ro-ro ships is required. On modern vessels, readily accessible walkways and stairways on and between decks have been provided for stevedores. On larger vessels, pedestrian walkways have been built into the ships' ramps (Fig 12). However, these type of features can only be incorporated during vessel construction. Those responsible for the construction and operation of new ro-ro vessels should bear vehicle/pedestrian segregation very much in mind. Modification of existing ships is extremely difficult. It is incumbent on the stevedores to adopt a safe system of work to ensure the safety of all who operate on board.

85 An entirely separate means of access should be provided for those not engaged in the operation of the ro-ro ship, such as passengers or visitors. The ship's accommodation ladder can be used for this purpose. Alternatively, special gangways can be provided which give access without interfering in the working of the ship. Cargo ramps should only be used as a means of access for passengers or visitors when work has ceased or been suspended. Strict supervision is essential to ensure that persons do not embark or disembark during operations.

86 The following example illustrates the difficulties which arise in segregating passengers and traffic. A ro-ro ship was provided with a passenger lift which ran from the accommodation above to the cargo handling area below. Once at the cargo handling level, the passengers would disembark using the stern ramp. To get to the stern ramp, the passengers had to cross 4 lanes of container traffic and trailers. In addition, a cargo lift was sited next to the lower landing gate of the passenger lift. Until these points were brought to the attention of the shipping company, no control over embarkation and disembarkation of passengers had been exercised.

Cargo lifts

87 Considering the extent or ro-ro shipping, there have been relatively few accidents reported over the years involving cargo lifts. However, the accident potential of lifting appliances which repeatedly move up to 70 tons is obvious. The principle hazards to safeguard against are persons falling through the deck opening, persons being crushed underneath the platform, and persons being struck by falling cargo.

88 To prevent persons falling through the deck opening, fixed side barriers and hinged interlocked end barriers should be provided at the upper deck opening(s). The barriers should be kept in position at all times during operations; Fig 13 illustrates this type of arrangement. The barriers should be substantial enough to withstand the impact of lift trucks and other vehicles. The end barriers should be positively interlocked with the lift movement and should be hinged to operate in the vertical plane.

89 A variety of safeguards are necessary to prevent persons being crushed beneath the platform of the lift.

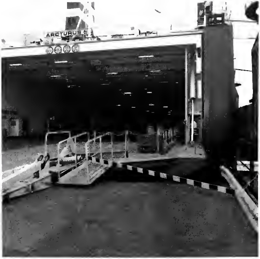


Fig 12 Segregated passenger access via ramp of ro-ro vessel.

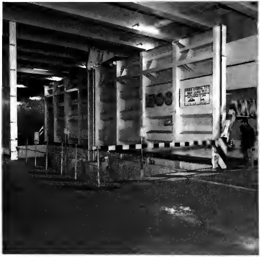
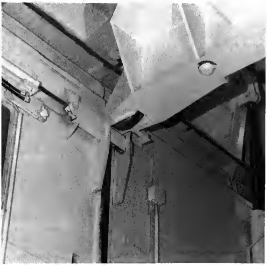


Fig 13 Fixed side and hinged interlocked end barriers at cargo lift

Fig 14 Interlocked latches hold platform during loading



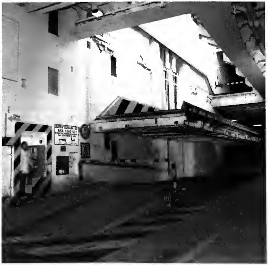


Fig 15 Safe operating position for cargo lift.

Latches which lock the lift at the upper deck level during loading may be required to prevent the sudden descent of the platform (Fig 14). The latches should be interlocked to the movement of the lift. Slack chain switches should be installed to prevent the sudden descent of a rope or chain suspended lift following a temporary jamming of the platform. Trip bars situated below the platform, both at its end and its sides, which stop the lift immediately on activation should be provided. However, on very large cargo lifts, the fitting of trip bars may not prevent a person being crushed at the centre of the platform. As an alternative, the controls of the lift can be designed so that operators must be stationed at all of the control positions at the operational decks before the platform can be moved. The lift can be stopped in an emergency at any one of the control positions by operation of a 'dead-man's handle. This alternative type of safeguard must be backed up by the vigorous exclusion of all other personnel from the cargo lift area. (Figure 15 illustrates a lift control operating position).

90 Falling cargoes are usually as a result of fouling underneath the upper deck opening. Trip bars or an arrangement of photo-electric cells sited below the upper deck opening should be provided and either device should immediately stop the lift if a cargo or vehicle overhangs the platform side.

91 In addition to the safeguards detailed above, warning lights and bells or klaxons should warn persons that the lift is operating. Lifts should be marked with the safe working load and instructions as to correct usage. Man-riding on the lifts should be strictly prohibited.

Only drivers who remain in the cab of the vehicle being used to load or unload should be allowed on the moving platform.

Noise

92 Overall traffic noise, together with reverbation from the ship's structure combine to produce noise levels which are characterised by high intensity but relatively low frequency. Noise levels recorded are, typically, in the range of 95 to 100 dB(A). Sound-proofing of the cabs of docks vehicles used on ro-ro operations can reduce the ambient noise levels for the driver to below 90 dB(A). Maintenance of the sound proofing is vital to ensure continuing noise reduction. Where sound-proofing the cab is not effective — and this applies particularly to older vehicles — and where personnel other than drivers have to work within the holds, then hearing protection should be considered. To be effective it should be well maintained and worn at all times.

93 Consideration should be given to reducing noise levels at source. Two important contributors to the overall background noise level on board are the ship's ventilation system and the hydraulic accumulators of the cargo lift. On a recently built ship, the hydraulic accumulators created a persistent whine. Replacement of original metal pipework by a flexible substitute produced a significant reduction in the background noise levels.

Fumes in vehicle transport ships

94 The purpose-built vehicle transporting ship is a specialised type of ro-ro vessel. such ships have up to 12 decks with a low deck height of about 6ft. Up to 4000 motor cars may be carried by such a vessel. Some older ro-ro ships have been converted to carry vehicles in large numbers.

95 During the loading and unloading of vehicle transport ships, quantities of carbon monoxide are emitted from the exhaust system of the vehicle. Measurements of carbon monoxide concentrations during unloading have been taken on several individual ships. In one case, the levels recorded range from 10–20 parts per million (ppm) after 10 minutes to as high as 800 ppm after 2 hours. Threshold Limit Value 50 ppm. Blood samples were also taken, showing a peak level of 25% carboxyhaemoglobin. In addition to effective ventilation, a system of work is needed to control the movement of the vehicles. The number of engines running at any one time should be kept to a minimum.

96 In the first instance, reducing the levels of carbon monoxide should be achieved by improvement in the ship's ventilation system. This should be backed up by the provision of a system of working which minimises the exposure of all personnel, dockers, maintenance fitters, insurance representatives, ships' crew members, to the toxic fume. The system should be such that queuing to leave the ship is reduced to a minimum, car-engines are not left running within the hold awaiting drivers, over-revving is avoided and clearance of temporary obstructions is achieved without entry of all drivers etc into the hold.

Bulk hazardous cargoes

97 The loading and unloading of bulk hazardous cargoes is the aspect of dock operations which gives rise to most public concern. The operations involve the use of special purpose built vessels designed to transport, in bulk, a variety of hazardous liquids and gases on a worldwide basis. The major hazard associated with this activity is the accidental release of the hazardous cargo and the effect this release may have on persons both involved in loading or unloading and within the vicinity of the terminal.

98 The responsibility for the design, manning and safe navigation of hazardous cargo vessels using British Ports rests with the Marine Division of the Department of Transport.* The role of the Factory Inspectorate is to ensure that, during loading/unloading operations, the system of work employed is as safe as is reasonably practicable and that the equipment in use, including the ships', is properly maintained. With this role in mind, the Inspectorate has undertaken an extensive programme of training to ensure that Inspectors are fully aware of the hazards and are able to give advice about elimination of risks.

99 Despite the fact that most bulk hazardous cargo terminals in the UK now employ safety check lists to monitor operations, Inspectors visiting terminals still find basic safety faults, which should have been identified and rectified by management. Typical faults included ullage ports left open and without flame traps during unloading; doors and ports left open allowing flammable gases to enter accommodation areas; defective gas-tight lighting in hazardous areas; and failure to keep ready safety equipment such as fire fighting appliances, rescue harnesses and life lines during cargo handling operations. Problems have also arisen with the ship's equipment and in several cases enforcement notices have been issued to ensure that defective equipment was repaired or replaced. The standard of management on board can vary also; at an inspection of a gas carrier discharging at a Scottish Port, the master was found to be smoking a cigar while standing in a no smoking area!

100 Whilst many of the hazardous cargo terminals are constructed, equipped and maintained to international standards, some, especially in terms of fire fighting equipment, are not. For example, the fire fighting equipment at one jetty which handled both propane/butane gas and oil products consisted of two hand held extinguishers. Following discussions with all interested parties, an enforcement notice was issued requiring the provision of specified fire fighting equipment involving expenditure in the region of £200,000. As a result of a programme of visits to terminals currently being carried out by Inspectors, it is hoped to set definitive standards on the fire precautions to be adopted at bulk hazardous cargo terminals. In the meantime, terminal operators should examine in detail the adequacy of existing fire fighting equipment and arrangements.

101 Nevertheless, in most cases the terminal fire fighting arrangements are only capable of containing the fire awaiting the arrival of the local fire brigade. It is important, particularly when the terminal takes the form of a jetty, that the route for the fire appliances is maintained free of obstruction whenever a hazardous cargo vessel is berthed. In one recent incident, the local fire brigade found the jetty blocked, resulting in vital minutes being lost as fire fighting equipment was manhandled into position.

102 Access for, and co-ordination with, the Fire Brigade will form one part of the written emergency plan drawn up for the bulk hazardous cargo terminal. The emergency plan drawn up should be regularly subjected to exercises or dummy runs to ensure that all personnel and methods of containment or fire fighting are effective.

103 During the last six years, there have been a number of incidents throughout the world involving oil tankers, chemical carriers and liquefied gas carriers. In many instances, the vessels were lost at sea due to fire and explosion, and although the direct cause of each incident has not always been determined, in most cases human error has played a part. Readers will recall the incident which occurred at Bantry Bay as an example of what can happen. Fortunately, there have been few incidents in Britain involving fire on hazardous cargo vessels, and only one of these incidents affected the cargo, resulting in a small explosion. The circumstances surrounding five incidents are now detailed to demonstrate the type of problems that can occur.

Incident No 1

104 A tanker of approximately 20,000 tonnes dead weight constructed in about 1960 was berthed at a UK hazardous cargo jetty. The engine room and some accommodation was situated aft, the officers' quarters, a common room and pantry were amid ship. In the early hours of the morning the Chief Steward, returning to the ship from shore leave, noticed that a coffee percolator was bubbling on a unit at the side of the pantry. He returned to his own room, but shortly

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*Operational requirements for the loading and conveyance of some dangerous substances in harbour areas are still dealt with in byelaws made by the harbour authority.

afterwards smelt smoke and on investigation found a unit surrounding the coffee percolator ablaze. The fire swept through the mid-ship area alleyways, affecting much of the centre accommodation. The fire was finally brought under control by the ship's crew and the Fire Brigade, but a subsequent search of the accommodation revealed that one member of the crew had died as a result of the smoke generated.

105 The electrical supply for the lighting and power sockets in the accommodation was at 200V DC current. Because DC electrical appliances had become rare over the years, an AC supply for use with outlet sockets at 220 volts had also been fitted. The coffee percolator was an AC appliance, but examination revealed that it had been plugged into the DC supply. The dispositions of the live and neutral pins on both the AC and DC sockets were such that the AC plug could be fitted to the DC socket, but not vice-versa. It appears that the DC caused the percolator to overheat or boil dry but the cut-out did not activate, leading to overheating of the element and fire in the woodwork of the pantry unit.

106 Fortunately, the fire did not spread to the cargo tank spaces, but if the ship had been ballasting its cargo tanks, which had contained motor spirit, flammable vapours would have been displaced into the main deck quite close to the fire in the accommodation and the outcome may well have been very different.

Incident No 2

107 A product tanker was discharging heavy cat naphtha at a UK jetty. After three hours, a fire was discovered in the pump room by an officer making a routine check on the pumps. The pumps were shut down, the pump room sprinkler system operated and the fire extinguished. Investigation of the incident revealed that the top seal of the No 4 pump had broken and that the hot bearing trip had operated at the time of the fire. Subsequent inspection of the fire damage in the pump room revealed heat blisters on the bulkhead adjacent to the engine room. It was also noted that a 700 tonne naphtha tank was situated immediately above the pump room. Had a vapour build up occurred, rather than ignition of the leakage from the seal, then an explosion would have resulted, possibly rupturing the naphtha tank.

108 Following the fire, it was necessary to agree with HSE an acceptable safe system of work to remove the slops in the pump room. The contents of the defective pump were released into the pump room and a blanket of foam was laid over the liquid. With a fire tug standing by, the slops were then transferred to a petroleum barge.

Incident No 3

109 A tanker was discharging gas oil and motor spirit at a UK jetty. An engine room crewman discovered a fire in the engine room storeroom, the ship's fire alarm was sounded and discharge of the cargo was stopped immediately. The fire was extinguished by the ship's crew, together with the local fire brigade. There was no immediately identifiable cause for the fire. It may have been that a cigarette end was dropped onto some oil-soaked cotton waste in the storeroom. In this case, prompt fire fighting assured that little damage was caused and there was no risk of involvement of the ship's cargo. However, the event highlights the need for adequate storeroom precautions.

Incident No 4

110 A product tanker arrived at a UK port in ballast to load petroleum spirit at a hazardous cargo jetty. The vessel had ten cargo tanks forward, separated from the engine room aft by a pump room. The pump room contained three screw displacement pumps, each driven by a drive shaft which passed through a gas-tight seal in the bulkhead to auxiliary engines situated in the engine room. The cargo tanks were washed at anchorage and the vessel de-ballasted after berthing. Loading was carried out using a shore pump via the vessel's No 1 cargo pump by-pass into the tanks. One isolation valve on the pump was left open prior to loading, and as a consequence petroleum spirit leaked from the pump into the pump room to a height above the bulkhead seals. The seals could not prevent the petroleum spirit leaking into the engine room, where a generator and electrical equipment were operating. An explosion occurred in which the chief engineer was killed and the mate seriously injured. A fire followed the explosion and the engine room and accommodation quarters were burnt out. The fire was contained aboard the vessel and the jetty installation was undamaged.

Incident No 5

111 During 1981 an incident occurred at a South Coast port when a foreign cargo vessel was allowed to dock following a radio report from its master that part of its cargo, which consisted of drums of toluene, methyl ethyl ketone and diethylamine, was leaking and that the smell of vapour was passing throughout the ship. The vessel had a single hold in which twelve containers holding plastic granules, together with approximately 21 000 gallons of highly flammable liquid in 40 gal. drums was stored. Tests carried out at

one of the hold access hatches some 35ft above the bottom of the hold, revealed significant levels of toluene in the air. Arrangements were made to purge the vessel with nitrogen and a limited evacuation of families living within 500yds of the quay was undertaken. After purging, the hatch covers were withdrawn fully allowing the hold to vent to atmosphere.

112 Subsequent inspection of the cargo revealed that 41 drums were considered sufficiently seriously damaged to warrant detailed examination ashore. One drum was severely holed at its bottom and had obviously been trapped by the corner of a container. Two other drums were approximately half empty. Six others had been fitted with damaged caps, which were leaking.

113 The cargo was loaded at a foreign port and it clearly had been roughly handled during this operation. The failure to safely stow a consignment of hazardous cargo can have serious and costly consequences, as this incident illustrated.

Health hazards

Bulk dusty cargoes

114 Loading and unloading of bulk dusty cargoes can lead to emissions of dust (Fig 16). These emissions are significant from an occupational health, from an environmental and from a commercial point of view (due to the consequential loss of part of the cargo). As indicated in para. 8, the British Materials Handling Board are currently undertaking a survey into the reduction of dust emissions during loading and unloading.

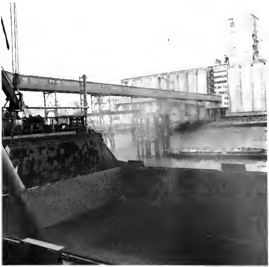


Fig 16 Example of dust emitted during loading.

115 Until such time as this research bears fruit, conventional dust emission control measures should be utilised. For example, recognising that entrainment of air as the cargo leaves the ship-loader spout is the main cause of excessive dust emissions, control devices have been provided at the spout to prevent this. Alternatively, totally enclosed conveyor systems have been installed to keep dust losses to a minimum. Even damping down cargoes which have a fine dry dust content can alleviate the problem considerably.

116 Nevertheless, problems with dusty cargoes will continue to arise, particularly where cargoes are loaded or unloaded using mechanical grabs. Until such times as alternative methods of handling can be devised or plant installed to control the dust emissions at source, respiratory protective equipment may have to be worn. In the past, respiratory protection has been confined, generally, to nuisance dust masks; approved ori-nasal respirators being uncomfortable in a hot or arduous environment. More recently, a number of companies have successfully experimented with ventilated helmet respirators (Fig 17). This type of equipment is lightweight and incorporates a face visor, helmet and pump which blow filtered air across the face, thus allowing for perspiration. The helmets provide protection where dust emissions cannot be controlled adequately at source. It should be noted however that for certain dusts, this type of helmet has not been approved.

Fumigation of containerised cargoes

117 Freight containers may carry cargoes which require fumigation and in the past, methyl bromide has been used as the fumigating agent. However, methyl bromide can affect the cargo itself, so phosphide preparations are now used in preference. On contact with moisture, the phosphide preparations release phosphine gas which acts as the fumigant. The preparations take longer to act than methyl bromide and 5 to 7 days can elapse before fumigation is complete. However, if the phosphide preparation is incorrectly applied, the fumigation process may take considerably longer than 7 days. Several incidents have been reported in which dock workers, port health workers and others were seriously affected by phosphine gas, following the opening of the doors of a fumigated freight container. In all of these cases, the fumigant had not been properly applied and residual phosphide was found in the container.

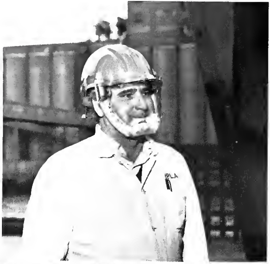


Fig 17 Ventilated helmet respirators give protection plus comfort.

118 All handlers of fumigated freight containers should ensure that at least the following precautions are taken:

(a) The exporter of fumigated containers should be made aware of the potential problem of residual phosphine gas and of the need to apply the phosphide preparations in accordance with the manufacturers' instructions.

(b) Containers should bear the appropriate hazard warning label.

(c) Containers should be labelled with the date the fumigant was applied.

(d) Upon opening, the container should be ventilated in a safe place for at least one hour.

(e) Testing for phosphine gas after the ventilation period has elapsed should be carried out.

(f) Entry of personnel into fumigated containers should not normally be permitted until sampling has indicated that it is safe to do so. Entry before ventilation and sampling should only be effected if absolutely necessary and the personnel involved should wear suitable respiratory protective equipment.

(g) Disposal of phosphide residues should be carried out in a safe manner, i.e. into water in the open air.

Asphyxiation

119 Entry into confined spaces with an oxygen-depleted atmosphere has caused deaths in many industries, and the docks industry is no exception. Both dockers and maintenance personnel may face this particular danger. Cargoes such as woodchips in bulk or whole logs which have been attacked by fungi, are known to reduce the oxygen level in the space where they are stored. Similarly, the inner chambers of pontoons, dry dock caissons or other metal structures which have rusted may expose the maintenance man to an oxygen-depleted atmosphere.

120 Those types of cargo and those confined spaces where the problem of oxygen depletion might exist should be clearly identified. Before entry into such a cargo space or confined space is attempted the space should be well ventilated and tested by a competent person to ensure that the level of oxygen is sufficient. Safe operating procedures can best be implemented using a permit to work system and detailed advice on the drawing up and implementation of a permit to work system is given in Guidance Note GS5: *Entry into confined spaces*. The guidance note also covers the precautions which must be observed on those occasions when it is necessary to enter such a confined space using breathing apparatus.

Vehicle exhaust emissions

121 Vehicle exhaust fumes emanating from fork lift trucks in use in the holds of conventional ships and from tugmasters and other prime movers on ro-ro ships can give rise to problems. For example, a dock worker was operating a fork lift truck in a small locker room measuring 27ft by 17ft by 12ft high. After half-an-hour's working, the docker collapsed and if he had not been spotted by one of his workmates, the consequences could have been fatal. The locker room had no mechanical ventilation and the natural ventilation provided by the doorway into this confined space was obviously insufficient.

122 Wherever possible, mechanical ventilation should be provided in every confined or semi-confined space where internal combustion engine-driven vehicles work. In this context, modern ro-ro ships are provided with mechanical ventilation designed to bring about approximately 30 air changes per hour on the totally enclosed decks. Air changes of this order are generally sufficient to cope with fume generation during normal working.

123 However, older conventional or ro-ro ships may have either no, or limited, mechanical ventilation; in which case, vehicle exhaust purifiers such as catalytic converters can be fitted. Given regular satisfactory maintenance, the catalytic converter can reduce carbon monoxide emission concentrations from 3.5% to as little as 0.006%. Other toxic contaminants in the exhaust emission, such as aldehydes and soot from diesel and petrol-driven vehicles, can also be reduced in this way. Unfortunately, the efficiency of the converter is drastically impaired by certain 'catalytic poisons' such as the lead in leaded petrol. Other systems for exhaust purification are available and the vehicle manufacturer or supplier should be consulted as to the most suitable type for a particular application.

The role of HM Factory Inspectorate

124 Until 1975, the main concern of HM Factory Inspectorate was loading and unloading at docks, wharves and quays, but the Health and Safety at Work etc Act 1974 extended the scope of health and safety legislation to all places of work within the territorial baseline. The all embracing nature of this Act has resulted in inspectors paying visits to many types of maritime activity on both a routine and an accident investigation basis. The failure of a grab crane aboard a dredger, the parting of a tow-rope on a tug and an accident to the ship's cargo lift which occurred while the vessel was offshore but within the territorial baseline, indicates the wide range of activity and work places which have been covered. To illustrate some of the problems which have been encountered, the examples of chain ferries, tugs, engine rooms and lifting appliances on board vessels have been selected; the prevention of slipping accidents on smaller vessels by the provision of a safe place of work is also covered.

Chain ferries

125 A complaint was received regarding the condition of a chain ferry. Investigation revealed that the ferry was a steel-hulled, wooden decked craft about 20 years old with a capacity for 28 cars plus passengers on the car deck and for an additional 150 foot passengers on the side and upper decks. A large number of defects were found throughout the vessel; the life-saving appliances were unserviceable; there was no means of radio communication between the ferry and other vessels crossing the ferry's path; the fire separation between the engine room, in which a fuel tank was leaking, and the accommodation above was poor. Furthermore, the standard of machinery guarding in the engine room and the overall standard of electrical installation throughout the vessel left much to be desired.

126 In view of the conditions found, an immediate Prohibition Notice was served requiring the important defects to be rectified before the ferry could be brought back into use, a process which took five days. Subsequently Improvement Notices were issued on the remaining matters. Owners and operators of chain ferries are urged to examine the safety of their vessels and to contact the local HSE office for advice where necessary

Tugs

127 There have been several serious accidents, some fatal, when tow-lines have parted suddenly and a member of the tug crew has been caught by the whiplash. In most of these incidents, the crew members have been standing on the aft part of the deck, making adjustments to the bridling gear. On certain modern tugs, adjustment of the bridling gear can be made from the sanctuary of the accommodation, precluding the need to be in the aft section of the boat. On vessels where it is necessary to go aft to make adjustments, the tow-rope should be slackened off before the crew man proceeds to the gear. The Captain of the tug must ensure that this procedure is followed. Some tug owners have maintained that crew should be permanently stationed aft; in this case refuge shelters have been provided from inside which the necessary adjustments can be made.

128 Some of the failures of tow-ropes are due to inadequate maintenance. In one case, subsequent testing on a rope that had failed revealed the breaking strength to be only 25% of its rated capacity. Wherever possible, tugs should use their own properly maintained ropes, in preference to those of the vessel being towed.

Engine rooms

129 Routine inspection of various harbour and river vessels has revealed instances of defects in machinery guarding and in the electrical installations, which would not normally be found on similar shore-based plant. In a similar vein, engine room lifting blocks and tackle without test and examination certificates have been found in use. Wherever practicable, similar standards of safeguards should be provided both on and off-shore.

130 Asbestos lagging around exhaust pipes in engine rooms has also given rise for concern, the vibration of the pipes over a number of years causing the insulation to fray and break-up. In some cases, the asbestos lagging has been removed and replaced by non-asbestos products, in other cases, the lagging has been effectively sealed or encapsulated.

Lifting appliances on-board craft

131 Purpose-built floating cranes such as those used in dock work, on barges or salvage vessels should be of adequate strength and tested before being brought into use. Occasionally, a shore-based crane or excavator may be mounted on a barge or pontoon and used as a floating crane. In such circumstances, it is essential to seek professional advice to ensure that the stability of the vessel is not affected and that a new safe working load for the lifting appliance is established.

132 Cranes on board salvage vessels and dredgers should be fitted with a type of audible and/or visual overload warning device, since the weight of the load about to be lifted will usually be unknown. Cranes and associated equipment should be subjected to the same periodical examinations as similar shore-based plant, and should be regularly maintained.

Safe places of work

133 Slipping accidents on small vessels are numerous, although relatively few are serious. Vessel owners have been encouraged to apply anti-slip coatings to the weatherdecks and gunwales of their craft. This is particularly important on tugs and other vessels which are continuously manned. It is also important to keep the weatherdeck tidy and free from obstructions such as loose ropes.

Fatal accidents

Fatal accidents in the docks and maritime sector

134 A total of some 80 people were killed during the period covered by this Sector Report. The following paragraphs are brief narrative reports of the circumstances surrounding a selective sample of these fatal accidents. The purpose of the summaries is to highlight the contributory causes and to suggest how they may have been avoided.

Providing and following a safe system of work

135 The dust collection system at six pneumatic grain elevators was being converted from a cyclone to a bag filter system. The conversion work required removal of the redundant cyclones and the Port Authority maintenance department was delegated to carry out this work.

136 On the morning of the incident, grain had been discharged from a ship using the elevator and its associated cyclone. The discharge had ended around 10.30 am and at 1.30 pm the men were given the 'all clear' to commence work. The men proposed to remove the plant by cutting through the pipework at the top of the cyclone at its junction with the elevator using oxygen/propane burning equipment. The men removed most of the dust from the outside of the pipework to avoid a fire and commence work. A man was posted on the next floor down to watch for any fire that may have developed as the cutting commenced. When about one third of the planned cut had taken place, a violent explosion occurred within the plant blowing out of the side of the elevator at the level below which they were cutting. The man posted there was blown off and fell some 45 feet to the quay below. As a result of this incident a successful prosecution was brought against the Port Authority.

137 The dangers of hot cutting on plant associated with grain are well known and in particular the explosion risk necessitates that a pre-planned safe system of work be provided. This would involve the consideration of the various options for removal of the plant and if hot cutting is selected as the viable option, then thorough cleaning of the plant both inside and out before cutting commenced would be required.

138 A ship had been berthed in order to discharge its cargo of chipboard. During the initial unloading, the ship's permanent ladders into the hold had been obstructed by cargo and debris, so a portable ladder had been provided. On the final day of unloading, the obstructions had been removed and the dockers used the ship's ladders. The aft ladder had rungs missing and during a tea-break the ship's crew set about repairing it. Unloading continued until the hold was empty and the four dockers left in the hold began to make their exit — two via the forward end, two via the now usable aft ladder.

139 As one of the men emerging from the aft hatchway tried to squeeze through the gap between the hatch covers and the supporting structures, the ship's mate activated the hatch-closing mechanism crushing the man to death. The lack of communication between the ship's company and the dockers highlighted the need for the provision of a safe system of work for the movement of the hatch covers. This could best be achieved by a formal system for taking over and release of the ship's hold for the duration of the stevedoring.

140 The provision of a safe system of work is a necessary first step forward, but training and supervision are also essential to ensure that the system is understood and being followed. The transfer of aggregate from a ship to a shore based 20 ton storage

hopper and its subsequent discharge had been proceeding normally. A blockage occurred in the throat of the hopper and the several methods to remove the blockage from outside were tried, but failed. Entry into the hopper was required and a safe system of work for such an eventuality had been devised. The basic elements of this system were the complete electrical isolation of the plant by locking off mains switches with padlocks and the entry of the person into the hopper wearing a safety harness and rope. On this particular day, the system was not followed and the person who attempted to clear the blockage was eventually located trapped in the throat of the hopper.

Mechanical handling plant

141 The size of the large fork lift trucks and their loads contributed significantly to the circumstances surrounding the following two fatal accidents.

142 A fork lift truck with a variable width spreader attachment had to be returned from a maintenance workshop to its normal operational berth. As it was being driven with the spreader attachment raised to aid visibility, the mast of the truck struck an overhead gantry causing the gantry to fall onto a car below, killing both occupants instantly. An alternative route existed by which the truck had been safely moved to the maintenance shop the week before the fatal accident. Prior to the accident, the custom and practice for moving large loads involved the duty police officer who would select the appropriate route and then act as an escort. No consultation took place between escort and driver regarding the height restrictions enforced by the size of the truck. The driver, trained and experienced, had been concentrating on avoiding the considerable number of cars along the route.

143 In the second incident, a fork lift truck driver was returning a damaged paper reel back to a warehouse using a fork lift truck fitted with reel clamps. The warehouse was an old building with roof trusses. As the driver drove in, the mast was elevated sufficiently to strike a roof truss turning the truck over sideways. The driver was crushed between the edge of the overhead guard and the ground.

144 Both incidents illustrate that the provision of suitable warning devices en-route and detailed instructions to drivers are necessary in areas where, due to design or construction, height restrictions apply. The first incident also illustrates the need for pre-planning when moving trucks or loads to avoid permanent or temporary obstructions. The alternative of dismantling and re-assembling of whole loads needs to be seriously considered.

145 The dangers of improvisation whilst using a crane were illustrated in the following accident. Pipes were being unloaded from a lorry using a mobile crane. The height of the jib head sheave on the crane was such that at minimum radius it was impossible to lift the top pipe off the load. The crane driver decided to shorten the top strops or slings by which the spreader bar was attached to the crane hook by doubling them. Thus the angle between the strops became 150° rather than the designed 60°. The effect of shortening was that, due to the position of the wires in the crane hook, the strop on the open side of the hook rode up to bear onto the safety latch. Eventually the pin on which the safety latch pivotted sheared off and the front sling slipped out of the hook, releasing the pipes which were being lifted. The deceased was struck by one of the falling pipes.

146 Unusual loads and the need to assess critically the probable weight of such loads was demonstrated by the attempted lift of a buoy from a ship using a rail-mounted crane. The crane had a variable safe working load of between 10 and 3 tons. As the crane initially began to take the weight of the buoy, the overload alarm rang. The driver stopped the lift and reduced the lifting radius of the crane. The lift was recommenced, the crane tilted and the driver abandoned the cab by jumping to the crane platform. He stumbled and fell into the water and was drowned. The normal weight of the buoy was 4.8 tons and at the reduced radius the safe working load of the crane was about 7 tons. However, water had entered all four water-tight compartments of the buoy raising the weight to about 9.6 tons.

Transport

147 The increased use of wheeled transport to move goods around and to the dockside has brought about an increased risk to all personnel on foot, especially on and around the quay. The following fatalities all illustrate the basic principle that transport and pedestrians should be controlled so as to ensure segregation at all times. The examples are selected to cover three aspects of cargo handling plant — tug masters, straddle carriers and fork lift trucks.

148 The interface between pedestrian and vehicular traffic causes problems during the loading and unloading of trailers using tug masters. The two-man tug master team often split up, with the driver's mate guiding the tug master and/or trailer into position. The safe system of work provided should be such that, firstly, the driver and mate remain in visual contact at all times and, secondly, that crushing between tug master and trailer or trailer and trailer is avoided.

149 Failure to observe the first element of the safe system of work resulted in a driver's mate stumbling and being run over by the tug master when he proceeded up a land ramp ahead of the vehicle.

150 Failure to observe the second element of this safe system of work resulted, firstly, in a sucessful prosecution being brought. The fatal accident occurred in a ro-ro ship when an employee was crushed between two trailers. He was engaged in unchaining a trailer, when another trailer which had just been released ran down the slope of the vehicle deck. Although chocks were available, none had been utilised. The parking brake was not applied but the air brake was. However, due to a leak, the air brake system failed. The risk of trailers moving on sloping decks was considered entirely foreseeable. The registered dock workers were working for and under the control of the stevedore company who were successfully prosecuted for failure to provide a safe system of work. The incident could have been avoided if, for example, the restraining chain at the rear of the trailer had been left attached until the tug master was connected. Alternatively, the trailers could have been closed up and chocked.

151 A checker was run over by a straddle carrier during the movement of eight containers from the depot to the container stacking area. No formal system of work had been provided to control the checker and the straddle carrier (as detailed in para 58) to prevent contact between the plant and the pedestrian.

152 The danger to pedestrians in areas where fork lift trucks are used was demonstrated by these two incidents. In the first incident, a ship's tally clerk was walking across a berth when he was struck by a fork lift truck. The fork lift truck driver failed to see the clerk. The berth was characterised by its poor layout, with stacking being on an ad hoc basis. No designated pedestrian walkways were provided. Fluorescent jackets were provided, but in practice no one used them. No specific instructions were given to pedestrians or visitors who may have need for access to the berth.

153 In the second incident, a checker was run down by a fork lift truck which was carrying a baled load of pulp. The size of the load was such that forward vision was impaired. The fork lift truck should have been reversed, giving the driver reasonable visibility (see Fig 18 for an illustration of reduced visibility).

Falling objects

154 Falling objects threaten all personnel on the dockside. The example of a docker working in the hold unloading kegs of chemicals and being struck by one of the drums as it fell off the pallet board on which it was being slung aboard illustrates, graphically, the potential danger. The following two fatalities illustrate the circumstances surrounding this type of accident.

155 A gang were engaged in stowing in a lower hold following a partial filling of the hold. To accommodate the remainder of the cargo, some restowing was necessary. This included the moving of 3 cases which were stacked on top of each other and which were loaded against two crates. The crates were directly against the ships side and due to the curvature, the top crate overhung the bottom by nearly a foot. This affected the stowage of the cases rendering the whole stack potentially unstable. Whilst moving some cargo adjacent to the stack, the cases fell and crushed one of the gang to death.

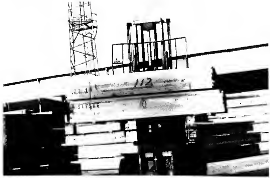


Fig 18 Seeing is believing in safety

156 The loading and moving of paper reels requires care and attention. During the loading of paper reels onto a lorry using a mobile crane, the counterweight of the crane hit an adjacent stack of reels awaiting loading, dislodging them. A member of an unconnected gang was talking to one of the loading gang, when the reel struck him and crushed him beneath it.

Alcohol

157 The provision of alcohol in and around the docks is as traditional as the songs which record the many effects of imbibing. The following accounts have been selected to illustrate that the docks present dangers to the alert and careful person — to the person who has consumed considerable quantities of alcohol, these dangers may prove to be insurmountable.

158 On a Friday night, a dredger tied up alongside a jetty but bad weather prevented the dredger moving the following day. On the Saturday evening, two of the crew left the dredger for a night ashore. On their return, they tried to board the dredger using a ladder which was secured on the boat and which was lowered, like a drawbridge, from the vertical position to rest against the jetty. One of the crew managed to get down the ladder, but the second fell from the ladder into the water between the fenders. Death was due to drowning. The alcohol level of the deceased person was recorded at 208 mg per 100 ml of blood.

159 A similar fate befell a night watchman on a dredger who left the vessel to spend some time in a local hotel. Evidence given at the inquest indicated that the deceased person had been served with some 10 to 12 pints of beer. It appeared that he had fallen into the water whilst trying to reboard the dredger.

160 The master of a ship which was in dry dock returned to his ship after a night out in the town. There was considerable slack in the ropes along both sides of the gangway. When he was found at the bottom of the dry dock, his trousers were undone and his underclothes soaked,apparently with urine; he had died of a fractured skull. The company was responsible for the operation of the dry dock were successfully prosecuted under Section 3(a) of the Health and Safety at Work etc Act 1974 for alleged failure to provide proper access. The post mortem on the Master indicated an alcohol content of 241 mg per 100 ml of blood.

161 Two of the crew from a collier which was being loaded went for a drink at lunch time. As they returned to their vessel, the collier was being resecured after having been moved along the quay to enable even distribution of the load in the hold. The access ladder and net were, therefore, on board. The first crew member stepped across from the quay to the bulwark, a distance of some two feet. The second member tried to do the same but fell down the space into the water. A post mortem on the decreased indicated an alcohol level of 227 mg per 100 ml of blood.

162 The consequences of driving after drinking are illustrated by the following two examples. A docker requisitioned a docks' minivan and drove along the quayside. In attempting to negotiate a left hand bend the van left the quayside and plunged into the water. Although the docker was rescued from the van within six minutes he had drowned. An alcohol level of 326 mg per 100 ml of blood was recorded. Similarly, a pump attendant at a power station was in the habit of cycling round the docks to get to his place of employment. Both the man and his cycle were found in a lock. The pathologist's report indicated that the alcohol blood level count was 294 mg per 100 ml of blood.

Conclusions

163 To have covered all the hazards associated with the docks and maritime industry would have produced a report of extraordinary length. Instead a sample, backed up by the accident statistics in the Introduction, has been selected to highlight to employers, managers, safety officers, supervisors, safety representatives and employees those areas in which accident prevention measures would best be directed in an effort to improve the industry's health and safety record.

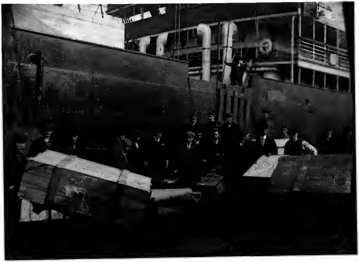
164 In addition to an accident prevention programme, the industry should concentrate on the following four health and safety problem areas. Firstly, no effort should be spared to reduce the numbers of accidents due to falls, falling objects and involving motor transport. Many of these accidents can be avoided by the provision of safe systems of work. Secondly, managements and employees should become obsessive about satisfactory maintenance and safe operation of all lifting gear and appliances. Where

necessary, documented procedures should be drawn up and supervised to ensure satisfactory standards. Thirdly, as changes in cargo handling techniques and equipment come about, the industry must plan for foreseeable difficulties and train accordingly. Fourthly, progress should be maintained towards minimising or controlling the hazards to health encountered within the industry.

165 The industry should also consider how best to alert those who work on and use the quayside to the potentially lethal consequences of alcohol consumption.

166 The National Industry Group will continue its liaison role with the industry and, via inspectors throughout the UK, will seek to improve standards of health and safety along the lines detailed in this report. In particular, the National Industry Group will be seeking to identify those ports or employers whose performance in the health and safety field is poor and will be directing special attention to these concerns.

167 International Labour Convention 152 and Recommendation 160 concerning health and safety in dock work were published in a Consultative Document by the Health and Safety Commission in 1979, and were laid before Parliament in a White Paper (Cmnd 8118) in 1980. In this White Paper, the Secretary of State advised Parliament that the Health and Safety Commission had decided to set up a working party to consider in more detail the advice they should give him about satisfaction of the Convention and acceptance of the Recommendation. With the assistance of this working party, work is now well advanced on revision of the Docks Regulations 1934. A consultative document which contains the new draft regulations is to be circulated. The Regulations will in general follow the lines of the Convention and take into account the Recommendation so that satisfaction of the former and acceptance of the latter can then be considered.



Muscle-power loading *Courtesy of the Port of London Authority*

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